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NETWORK ACCESSIBLE MULTI-TERABYTE ARCHIVE

NSSDC CONFERENCE
GODDARD SPACE FLIGHT CENTER
JULY 24, 1991

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Fred Rybczynski
Metrum Information Storage

ROTARY STORAGE SYSTEM (RSS)

- T-120 Super-VHS media with 10.4 GB per cartridge
- Very Large Data Store (VLDS) tape drives
 - Sustained 1.0 MB/S with Read-After-Write
 - 1E-13 Bit Error Rate w/ error mgt software
 - 45 sec average file access time
- Robots with on-line capacity to 6.2 TB
- Bar code reader
- Data management computer
 - Data referenced by file name
 - Files organized by hierarchical directories
 - File and directory access protections
- Network accessible

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METRUM INFORMATION STORAGE SYSTEMS BASED ON STANDARDS

MEDIA

- World-wide VHS media standard
- T-120 half-inch tape cartridge
- Billions of cartridges sold

TAPE DRIVE

- SMPTE format VHS transport
- Millions of transports sold
- Commercial grade

ROBOT

- Commercial broadcast industry

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METRUM INFORMATION STORAGE STANDARDS - concluded

BAR CODE READER

- Standard formats

INTELLIGENT DATA MANAGER (COMPUTER)

- UNIX based
- POSIX compliance

NETWORK CONNECTIVITY

- Ethernet TCP/IP and DECNET
- HYPERCHANNEL
- FDDI
- GOSIP
- NFS

MANAGED DATA STORAGE GOALS

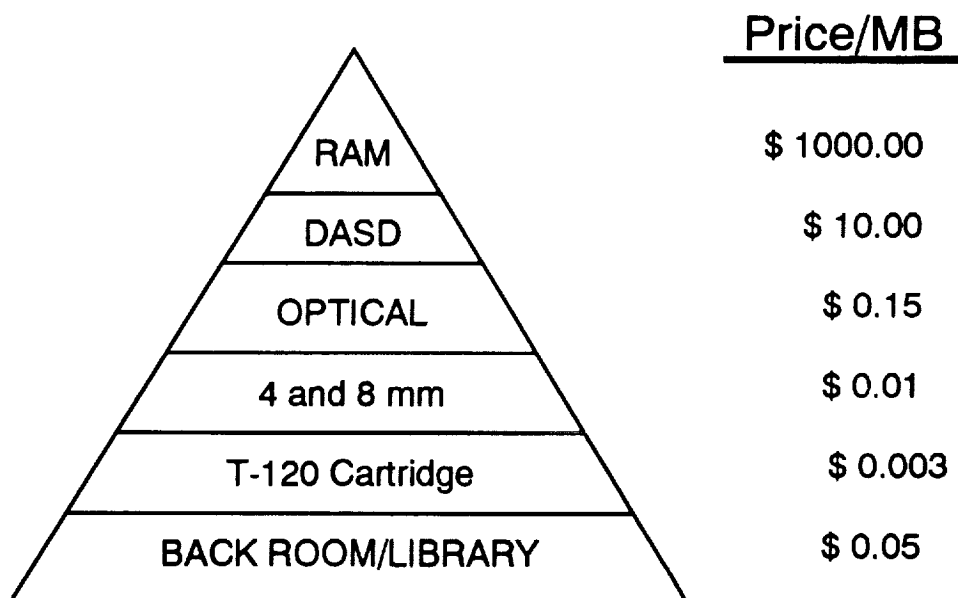
- Maximize data per unit volume, balanced by
 - Cost/MB of Media
 - Cost/MB of Technology
 - Required data rates
- Optimize media access
 - Unattended media access
 - Media ID verification
 - Speed of loading
- Provide ease of access to the data
 - Easily identify data to be stored/retrieved
 - Concurrent access from multiple computer systems

DATA SOURCES

- Data acquisition systems
- Data transcription systems
- Local computer file system
- Remote computer file system

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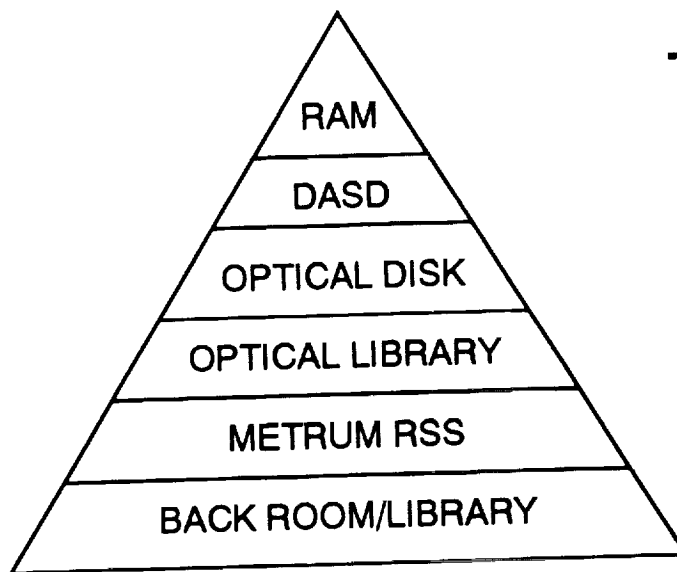
STORAGE HIERARCHY TYPICAL MEDIA PRICE/MB



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STORAGE HIERARCHY

TYPICAL ACCESS TIMES



Access Time

1 micro sec

15 msec

250 msec

10+ sec

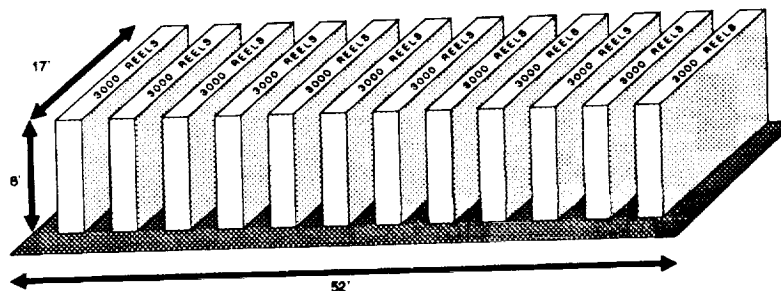
< 60 sec

min to hrs

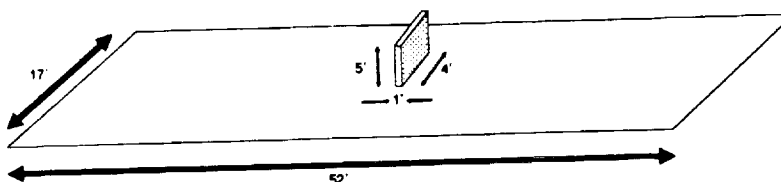
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VOLUME COMPARISON

6 Terabytes



9-Track, 6250 bpi
2400 Ft, 170 MB
35,000+ Reels
850+ Sq Ft



T-120 Cartridge
10.4 GB/Cartridge
600 Cartridges
4 Sq Ft

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VOLUME COMPARISON

One T-120 Cartridge (10.4 GB) Equals

- 61 nine-track reels at 2400 ft/reel, 6250 bpi and 170 MB/reel
- 50 cartridges of 3480 at 200 MB/cartridge

One Cubic Foot of Storage Can Contain

- 12-15 nine-track reels
- 60 cartridges of 3480 (equals 70 nine-track reels)
- 30 T-120 cartridges (equals 1,800 nine-track reels)

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RSS FEATURES

- 6.2 TB in < 20 sq ft
- System cost < 8.5 cents per MB
- Media cost < 0.3 cents per MB
- Unattended operation
- Network accessibility
- Read-After-Write reliability (1E-13 BER)

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RSS DATA ACCESS

- Archive system accessed via network
- Access authorization screening (UserID & Password)
- Entire archive looks like a single huge disk
 - Data accessed by file name
 - Multi-level hierarchical directories
 - Selective directory & file protection
- File access is random
- Avg file access is 45 sec for loaded cartridge
- Cartridge load in < 8 seconds
- Intelligent queue management

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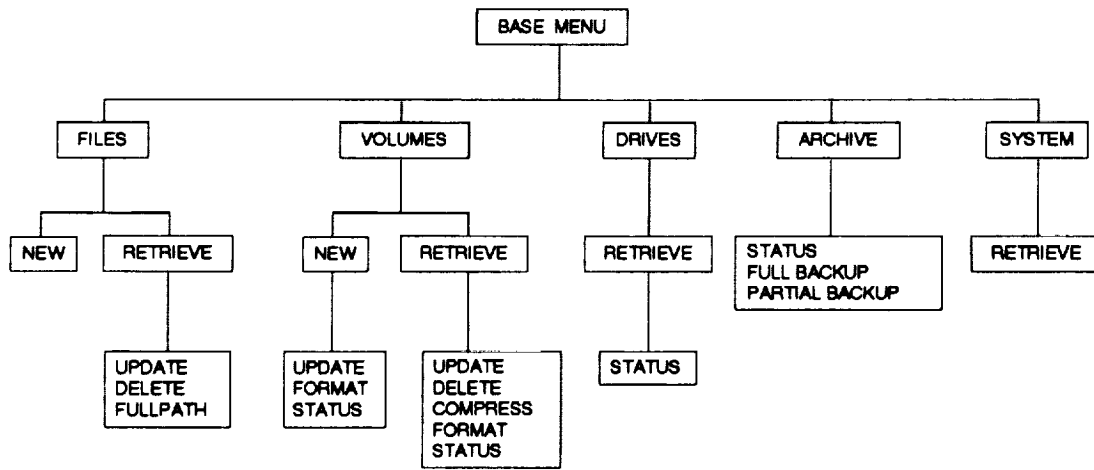
RSS DATA MANAGEMENT

- Database Management System
 - 90 million files
 - 65,000 cartridges
 - Maintains system performance log
 - Comprehensive report generator
- Monitors system events
 - Errors are categorized by severity
 - Multiple notification targets, including e-mail
 - Incorporates recovery algorithms
- User data can be directed to specific cartridge(s)
- Admin functions available at console & via network

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RSS ADMINISTRATION

MENU MAP



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[PS2101-01]

RSS ADMINISTRATION

BASE MENU

AMASS Administration

Version: AMASS/2.12

Files(1)	Volumes(2)	Drives(3)	Archive(4)	System(5)
Wipe(0)	Help(PF2)	End(PF3)	Quit(PF4)>	

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RSS ADMINISTRATION FORMS INTERFACE

FILES / RETRIEVE MENU

AMASS Administration

Name:	1990_wp_files	Record:	32
User:	100	Parent's Record	15
Group:	101	Volume:	
Mode:	nwx-----	Volume Group:	3
Type:	Directory	Starting Block:	
Size:		Bad Blocks:	
Archived:	01-13-91 13:18:22	Nr of Errors:	
Accessed:	01-13-91 13:18:22		

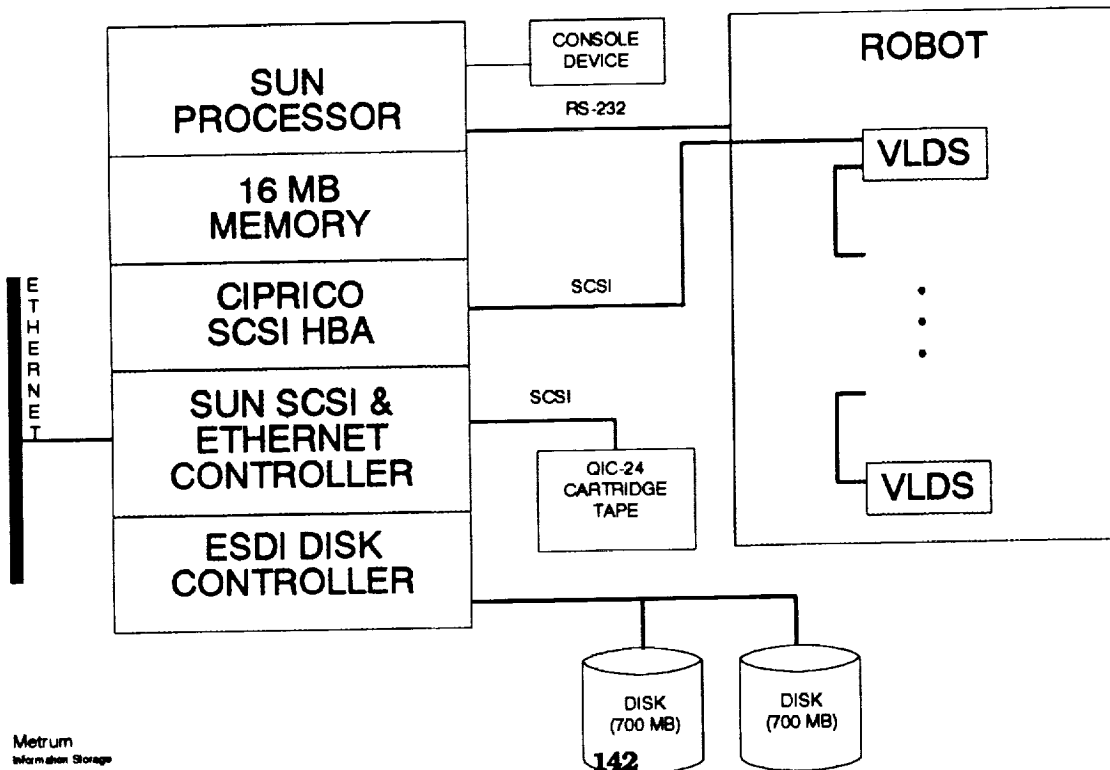
3 of 13

Files/Retrieve

Update Delete Fullpath

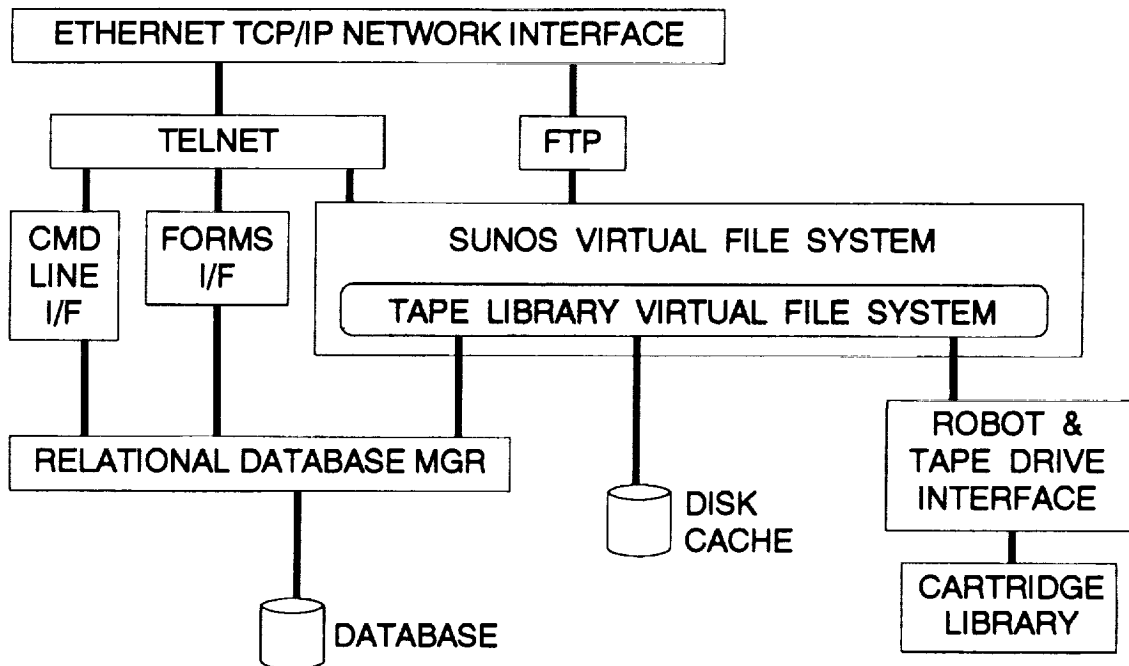
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RSS HARDWARE ARCHITECTURE



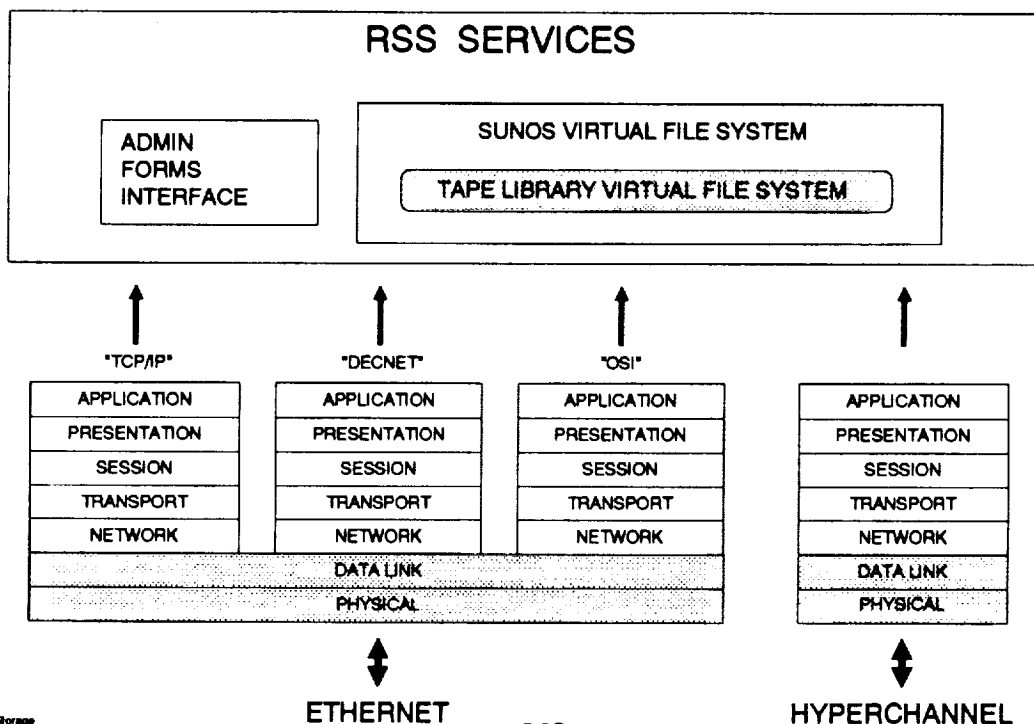
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RSS SOFTWARE ARCHITECTURE



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RSS SUPPORTS MULTIPLE CONCURRENT PROTOCOLS



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RSS ARCHIVE ARCHITECTURE SUMMARY

- UNIX-based operating system
- Standard network protocols
- User-directed archiving
- Supports automatic archiving
- Managed data
- Fast, easy access

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